Assignment 1 Answers

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Question 1: Asymptotic Notation

Question A (8 points)

Rank the following functions in order (non-decreasing) of their asymptotic growth. Next to each function, write its big-Theta value, (ie. write the correct $\Theta(g(n))$ next to each function but you are not required to prove the big-Theta value).

Function to be Examined	Big Theta Value

Question B (6 points)

Determine if each of the following statements are true or false. If the statement is false, provide a counter example. If the statement is true, justify the statement using the formal definitions from class.

1.

False. being just means that has an upper bound of n; however, it does not describe the lower bound. The lower bound could be much smaller. For example, binary search has a however, anything higher is a valid upper bound; hence, it is also

2.

True. The exponential function will grow larger asymptotically than the polynomial. Since the algorithm runs in then we can say that there exists a positive constant c, such that after some threshold k we have: . It would also be since there will exist some such that for all further n's, , . Hence,

3.

False. being does not necessarily imply that it is also . Since big O describes an upper bound, it asserts that there exists some constant c, such that after a certain threshold, k, However, this is not a strict upper bound. Our function could actually be and the above would still be valid, but it would be as well—this being the tighter lower bound. In that scenario, for all n after a large enough n.

Question C (16 points)

For each of the following , show that is for the correct function . Prove your result using the definitions from class, justifying your statement is true for all n k. (provide the value of k).